Template for project inclusion for Remote Sensing Systems' MSU/AMSU brightness temperatures in the C^2D^2 ARC (Applied Research Center) for Data Set Development.

I. Basic Description of Data Set(s).

A- **Specification of the specific variables contained in the data set(s)** Microwave brightness temperatures observed at the top of the atmosphere for MSU channels 2,3, and 4, and their equivalents constructed from AMSU instruments. These temperatures represent a weighted average of thick layers of the atmosphere.

B- **The type of observations used in the data set production** Satellite-microwave brightness temperatures from MSU and AMSU.

C- **The geographic area covered.** Global, from 82.5S to 82.5N Latitude.

D- **The temporal and spatial resolution of the data set.** Monthly, gridded on a 2.5-degree grid.

E- **Duration of the data set.** November 1978-present

F- **Standard interval for adding new data**. Monthly update - completed by 10th of month.

G- **Mechanisms maintained for accessing the data.** Web access browse maps and ftp access.
    http://www.remss.com/msu/msu_browse.html
    ftp://ftp.ssmi.com/msu/data/

H- **Current uses of data set(s) that support operational designation.** Required for formal national and international assessment activities.

II. Scientific Stewardship Activities Required for Continued Production of the Climate-Quality Data Set

A- **Quality control procedures, including ongoing improvements**. Brightness temperatures and geolocation data are quality checked for reasonableness. Brightness temperatures are cross compared with results from co-orbiting similar/identical instruments. Individual outliers are removed. Monthly results are compared to climatology to check for excess anomalies.

B- **Bias identification and processing.** The methods we use to identify and remove biases in the data are beyond the scope of this document. These methods are clearly described in:
Mears, C. A., M. C. Schabel and F. J. Wentz (2003). "A reanalysis of the MSU channel 2 tropospheric temperature record." Journal of Climate **16**(22): 3650-3664

C- **Reprocessing work underway**. We are about to "go live" with a new version of the data that includes AMSU measurements. This is critical due to the impending doom of the NOAA-14 satellite. We are also developing a "TLT" lower troposphere product based on MSU channel 2 and AMSU channel 5.

D- **Basic, "hands-on" utilization activities by involved scientists needed to assess the data set(s) quality and initiate prompt, remedial actions if problems are detected.** Monthly updates are visually inspected by a team of RSS scientists. Intersatellite biases are monitored so that if one instrument "goes bad" it would be removed from the processing.

E- **Identification of data set "point man" or "champion".** Carl A. Mears, Remote Sensing Systems

III Funding Request (in response to EA133E-04-RQ-0004)

Remote Sensing Systems Budget
December 1, 2004 - November 30, 2005

Direct Labor (salaries and wages)				
C. Mears	$55.16 / hour		196 hours	$10,811.36
Subtotal, Direct Labor (salaries and wages)				$10,811.36
Fringe Benefits	38.32%	of direct labor (salaries and wages)		$4,142.91
Indirect Costs	47.17%	of direct labor (salaries and wages)		$5,099.77
Total Cost				$20,054.05

Remote Sensing Systems Budget
December 1, 2005 - November 30, 2006

Direct Labor (salaries and wages)				
C. Mears	$57.37 / hour		190 hours	$10,900.30
Subtotal, Direct Labor (salaries and wages)				$10,900.30
Fringe Benefits	38.32%	of direct labor (salaries and wages)		$4,176.99
Indirect Costs	47.17%	of direct labor (salaries and wages)		$5,141.73
Total Cost				$20,219.02

Remote Sensing Systems Budget Detail

Remote Sensing Systems is proposing a three-year effort at a total cost of $63,843, as follows:

December 1, 2003 – November 30, 2004	$20,070
December 1, 2004 – November 30, 2005	$20,054
December 1, 2005 – November 30, 2006	$20,219
Total:	$60,343

RSS is proposing an indirect overhead rate of 85.4905%, which is the current DCAA-approved rate.

The direct labor rate for the principal investigator, C. Mears, is based on the amount currently being paid, and assumes a 4% per year salary increase. The direct labor hours do not include holidays and vacation time. Each year, there are 12 holidays and three weeks of vacation. This leaves 47 weeks of direct labor. At 40 hours per week, this gives 1880 hours/year, or 156.7 hours/month. Our estimates of direct labor hours are based on the 156.7 hour person-month.

The cost for holidays and vacation time is included in the fringe benefits category. Other overhead items include office rent, secretarial/bookkeeping/accounting, employee and property taxes, depreciation of equipment used for accounting and administration, employee benefits (health insurance and pension), and G&A. The current total overhead plus benefits rate is 5.4905% of direct labor; this rate was used as an estimate of future rates. The overhead rate is routinely audited by the Defense Contract Audit Agency. In the attached table, the overhead is broken into 2 parts: fringe benefits, and facilities and administrative costs. The total of these 2 figures equals the 85.4905% approved rate.

The RSS computing facility is a network of 30 high-end workstations (dual processors running at 1-3 GHz with 2-4 GB of memory) running under a Windows 2000 operating system. Multiple T1 lines provide a point-to-point connection to the NASA backbone. This facility currently processes data from six satellite sensors (3 SSM/I's, TMI, AMSR-E, and QuikScat) on a 24/7 near-real-time basis, providing ocean and climate products to users worldwide. Ten terabytes of on-line disk storage provides easy access to a wide variety of sensor and geophysical products covering the last 20 years of satellite observations. This current infrastructure is being provided at no cost to this proposed investigation.

Funding history of project: Project has already received $20,070.37 for December 1, 2003 to November 30, 2004.

IV. Transition of ARC Project to Operational Center

Outline pathway for eventual transition of your operational process to an established NOAA operational Center using the four steps outlined below.

1. **operational processing and data archive at PI's institution only.** We are very close to being operational in the sense of multiple people at the PI's institution being capable of performing the routine processing. Routine processing is performed by a Python script, which can be overseen by either the PI, or by Marty Brewer, the RSS web manager.

2. **data being archived at NOAA Center, but all processing at PI's institution.** Some data is currently routinely transferred to NCDC for use in various assessment products. Archiving all data at NCDC could be implemented at any time. Data is available in multiple formats for FTP by the 10th of each month.

3. **process being run in parallel at PI's institution and NOAA Center.** This step would require significant effort, since the processing system would have to be ported to whatever computer system is in use at the NOAA center. The current processing system is a complex mix of python, fortran, C++ and idl-based code with varying levels of documentation. The amount of effort would depend on exactly what is done to transfer processing to the NOAA Center, but in any case, the current level of funding is not sufficient to perform this work. There are two possible paths that I recommend.

   A. Remaining in the windows operating system. It would be easiest to transfer the processing to a windows based system. The easiest way to do this would be to buy a second processing computer, get the processing up and running here at RSS, and then ship the computer, complete with software, and currently archived data to the participating NOAA center. This path has both the advantage AND the disadvantage that is could be done without complete understanding of the processing system being transferred to the NOAA center.

   B. Porting to another operating system (e.g. UNIX). This approach would require a lot more work, since different compilers(FORTRAN and C), versions of IDL and python, plus a different file system would be used. The advantage would be that somebody at the participating NOAA Center would actually understand the processing system and bias removal algorithms.

   I estimate that Path A would take about 3 months of my time (~$60K), plus the cost of the computer, storage and software licenses (~$15K-$20K), plus maybe a month or so of effort from NOAA personnel.

   I estimate that Path B would take about 6 months of my time (~$120K), plus a corresponding amount of effort from NOAA personnel.

These cost estimates are dependent on exactly how much of the processing is transferred to NOAA. If only routine processing of swath data into a monthly gridded product, using existing calibration coefficients and adjustment procedures is done, the cost could be significantly less. These estimates include porting the code that does updates to the calibration and adjustment data, which we do on a monthly basis.

4. **processing and archive only at NOAA Center, PI performing Scientific Data Stewardship oversight as needed.** Once step 3 is complete and processing is stable at a NOAA center, this step is more a issue of trust than of effort. At this point, I am not sure how I can perform Scientific Data Stewardship without having a parallel processing system available to me (presumably at RSS) as a "testbed" or "sandbox" to try diagnostic tests without influencing the operational system at the participating NOAA center. So in some sense, I think that this step should probably never take place.